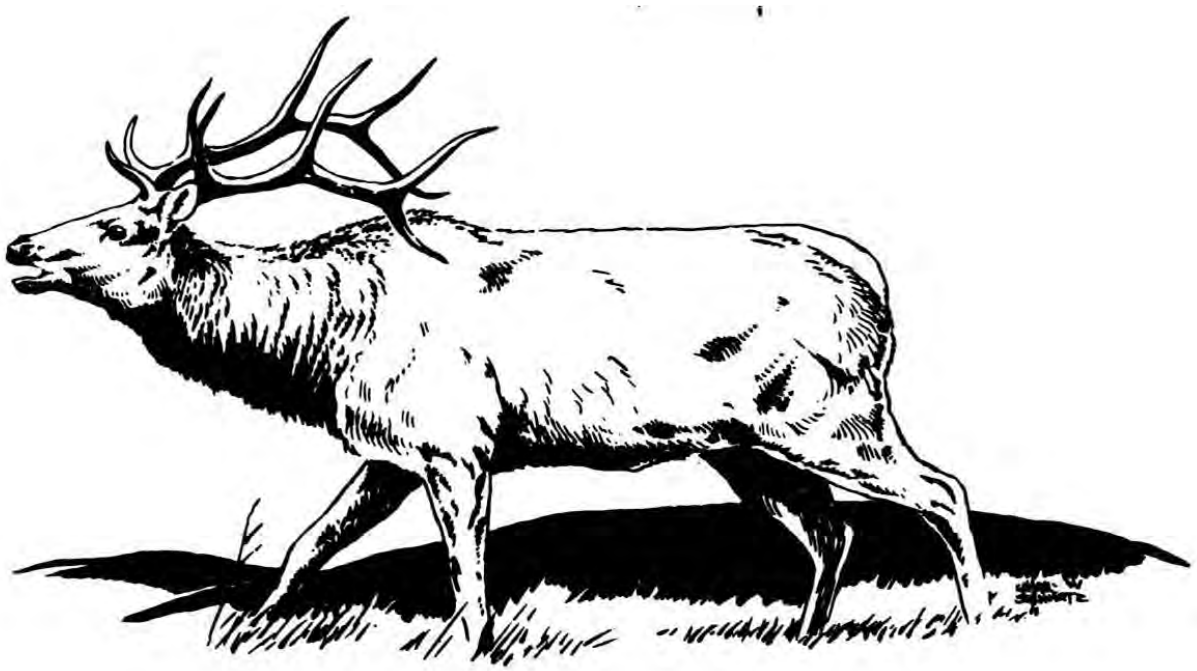
Elk Restoration in Missouri



Prepared for Consideration

by the Missouri Conservation Commission

October 15, 2010

Executive Summary

Background

Elk were found throughout Missouri prior to European settlement. Historical accounts indicate elk were likely extirpated from the state by 1865. Elk is a native species to Missouri, and restoring native species holds many benefits. Prompted by citizen requests, the Department conducted an elk reintroduction feasibility study in 2000. Results of the study indicated that elk restoration in Missouri was biologically feasible in portions of the Ozarks, and statewide the public supported the restoration of elk. Due to chronic wasting disease (CWD) and habitat concerns, the Conservation Commission suspended the Department's consideration of elk restoration in 2001 and directed staff to facilitate additional discussions to determine if concerns regarding elk restoration could be addressed.

Several factors have stimulated renewed interest in a Missouri elk restoration. Successful elk restorations in states such as Arkansas, Kentucky, Tennessee, and Pennsylvania have generated considerable natural resource management, recreational, and economic benefits. These restorations have also resulted in the development of proven disease testing protocols with no known cases of diseases being introduced to livestock or wildlife. In addition, a live-animal test for CWD has been developed.

Since the mid-1990's, significant habitat improvements, such as glade and woodland restoration and green-browse management, have occurred on conservation areas and other properties in the Peck Ranch Elk Restoration Zone. Glade and open woodland habitats provide an understory of herbaceous vegetation preferred by elk and other wildlife.

A recent letter from the Rocky Mountain Elk Foundation, continued citizen interest in elk restoration and questions from Conservation Commissioners stimulated a presentation at the July 2010 Conservation Commission meeting. The presentation summarized the 2000 elk study and provided an update on the issues of habitat availability and chronic wasting disease. Following the presentation, the Conservation Commission directed Department staff to reinstate plan development.

Elk Restoration Plan

The elk restoration plan is based on current information and knowledge, incorporating the following:

1. A well-defined **elk restoration zone** in portions of Carter, Shannon, and Reynolds counties with characteristics of large public land ownership, limited agricultural land, and few roads;
2. **Habitat management guidelines** for improving elk habitat on private and public land;
3. **Herd management guidelines** including release protocols, population objectives, monitoring protocols, actions to address elk that leave the restoration zone to private land where they are not welcome, and hunting as the primary management tool;
4. **Health protocols**, including animal health testing and a contingency plan, to ensure wildlife and livestock remain healthy; and

5. **Public input** by seeking comments through public meetings near the potential elk restoration zone and ongoing statewide requests for public comments, and providing information to citizens and organizations.

Elk Restoration Zone

A defined geography around Peck Ranch and Current River Conservation Areas was identified in the 2000 elk reintroduction feasibility study as a potential restoration site. A similar restoration zone was chosen for the 2010 elk restoration plan. The proposed elk restoration zone covers parts of Carter, Shannon, and Reynolds counties and is bounded by public roads, property boundaries, and other identifiable landscape features (Figure 1). This landscape was chosen because of:

1. Suitable habitat conditions,
2. High public land ownership and public access,
3. Low public road density,
4. Low density of row crops and livestock, and
5. Landowner support.

The 346-square-mile elk restoration zone consists of land held in public trust by the Missouri Department of Conservation, National Park Service and United States Forest Service (representing 49% of area). The Nature Conservancy (3% of the area) and Pioneer Forest, owned by the L-A-D Foundation (27% of the area), own and manage land in the proposed restoration zone and have provided written support for elk restoration. It is important to note that both allow public access. As a result, 79% of the land in the proposed restoration zone provides public hunting access. In addition, other private landowners in the proposed restoration zone have voiced support for elk restoration.

The proposed restoration zone is primarily forest and open woodland with scattered cool-season pasture, food plots, and old fields. An emphasis on glade and woodland management on Department lands and other properties since the mid-1990's has significantly improved habitat on this landscape for elk. The proposed elk restoration zone has limited agricultural activity with virtually no row crops and some open pasture and hayfields.

The restoration zone contains 33 miles of blacktop highway within the interior of the zone. Traffic surveys from the Missouri Department of Transportation indicate that vehicle volume on paved roads in the restoration zone is low when compared to other Missouri highways. In 2008, the average annual daily traffic volume on Highway 106 east of Eminence was 245 vehicles and Highway 106, just west of Ellington, averaged 386 vehicles per day. Highway 19 north of Eminence averaged 464 vehicles per day. Highway D, northwest of Van Buren, averaged only 326 vehicles per day.

Habitat Management Guidelines

Elk use a variety of habitats, but a mix of forest and openings (dominated by grass and herbaceous plants) is ideal. Elk also use forest openings, glades and woodland habitats. Since the mid-1990's habitat management on public lands and other properties have created woodland habitat that is conducive to numerous wildlife species, including elk.

Woodland management involves tree thinning and periodic landscape-scale prescribed burning (500 to 5,500 acre burn units) to create an open canopy with dense ground flora dominated by forbs, grasses and sedges; a landscape producing desirable forage and cover for elk. This type of management is also beneficial to deer, turkey, and other wildlife species. Woodland management will continue to encourage elk to utilize public lands. Other forest management practices, such as timber harvest and timber stand improvement, will continue as these practices enhance wildlife habitat and sustain forest health.

The Department will continue to manage and improve green-browse plots on conservation areas in the elk restoration zone. The National Park Service has also expressed an interest in improving bottomland fields (i.e. overseeding, renovating old fields, etc.) in the Ozark National Scenic Riverways to provide desirable forage for elk and other wildlife.

The Department continues to provide technical and financial assistance to private landowners seeking to improve wildlife habitat on their property. The restoration plan proposes working with other state fish and wildlife agencies to develop best management practices to minimize fence concerns. The restoration plan proposes establishing special habitat incentives for landowners in the elk restoration zone who are interested in improving habitat for elk on their property. Examples could include cost share for pasture conversion and providing legume seed for over-seeding existing pastures.

Herd Management Guidelines

SOURCE OF ELK, TRAPPING AND RELEASE: The number of elk proposed to be reintroduced the first year will depend on availability. A limited release of up to 150 elk in early 2011 is preferred. Following the health testing protocol, elk will be held in the state of origin for disease testing prior to relocation to Missouri. After disease testing is complete, elk will be transported by trailers to a holding pen on Department land in the proposed restoration zone.

The plan recommends a “soft release” technique for reintroducing elk to the restoration area. In a soft release, elk would be held in a temporary holding facility. Prior to release, the health of the elk would be evaluated, the animals would be fitted with radio telemetry collars and microchips and given time to recover from transport and handling stress before releasing from the holding facility. This type of release holds many benefits over a “hard release” where elk are simply transported to the site and immediately released.

MONITORING: Survival, reproductive rates and population growth will be closely monitored. All elk released will be fitted with radio telemetry collars and their locations monitored regularly to determine movement and habitat use. Measurements of the demographics of the herd (survival and reproductive rates) will be used to develop a population model which will track the success of the restoration effort and guide future population management.

HERD MANAGEMENT: Experience from eastern states shows that eastern elk behave differently than western elk because of favorable habitat and a mild climate. As a result, eastern elk do not make seasonal migrations to the extent that western elk do. In areas with quality habitat, which the proposed restoration zone offers, elk have smaller home ranges and exhibit less movement than in the western states.

The Department has developed, and the plan proposes to strictly enforce, procedures to address elk that wander outside the proposed restoration zone onto private land where they are not welcome. As proposed, the Department will contact the landowner in follow up to concerns within 24 hours of being notified by the landowner. Department office phone numbers and conservation agent phone numbers are already provided as a public service to citizens. Department staff will use various methods, including trapping and relocating or euthanizing elk, to remove them from where they are not welcome.

Hunting is proposed to be implemented as soon as possible after the elk become established. As part of the post-release monitoring, the Department will develop a population model that will allow prediction of population growth, determination of when a hunting season is appropriate and establishment of harvest quotas that will produce population levels compatible with available habitat and public interests.

Experience from other eastern states has shown that managed hunts are effective at maintaining an appropriate population density. In Kentucky, hunters must draw for an elk permit inside the state's elk area where most elk occur. However, hunters may purchase an elk hunting permit to hunt elk outside the state's elk hunting zone where a few elk occur. This combination of liberal hunting outside the elk zone and controlled hunting in the zone has proven effective in managing Kentucky's elk herd and serves as an example to consider when elk hunting regulations are developed in Missouri.

Health Testing Protocol

Working in cooperation with the Missouri Department of Agriculture and wildlife health experts from other states, the Department has developed stringent animal health testing guidelines to ensure that Missouri's wildlife and livestock remain healthy. The health protocol requires that all free-ranging elk brought into Missouri go through extensive disease testing prior to moving the animals into the state and prior to release.

Free-ranging elk relocated into Missouri for the purposes of the proposed elk restoration must originate from a CWD-free state. Elk will be tested for CWD, brucellosis, blue tongue, anaplasmosis, epizootic hemorrhagic disease, vesicular stomatitis, Johne's disease and bovine tuberculosis prior to shipment to Missouri.

Since 2000, there has been significant progress made in understanding chronic wasting disease, including a live-animal test for elk. Other states with successful elk restoration projects have followed similar health protocols that have resulted in no cases of disease transmission to livestock or wildlife. It is important to note the health testing protocol is more stringent / restrictive than animal movement protocols currently required to move livestock or captive elk into Missouri.

Public Input

Successful management of Missouri's natural resources involves a partnership with citizens, organizations, and agencies. The Department has actively engaged citizens and organizations to gather input on the proposed elk restoration plan. It is important to note that information gathering has specifically included many opportunities to ensure citizens within and around the proposed restoration zone had opportunity to comment.

Public input included three open house public meetings in the area of the potential restoration, local efforts by Department staff to meet with citizens and ongoing requests for public comment opportunities via internet, email and letters. Department staff also met with state and federal agencies, conservation and agricultural groups and other organizations to discuss the proposal and gather input. The Department has provided information to citizens via the Department website, two articles in the *Missouri Conservationist*, videos, and news releases and on both radio and television.

The majority of comments received at the three public meetings near the proposed restoration zone were in favor of elk restoration. Local efforts by staff to meet with landowners in and around the restoration zone indicate most landowners support elk restoration. Statewide, many of the comments received support elk restoration. Reasons cited include restoring a native species, hunting, wildlife viewing, and economic benefits.

Some citizens are opposed to or have concerns with restoring elk to a defined geography in southeast Missouri. Reasons cited include potential property damage, vehicle collisions, animal health concerns, and restoration costs. Some also have concerns that elk may spread statewide.

Recreational and Economic Benefits and Partnerships

ECONOMIC BENEFITS: Experience from other states that have restored elk, such as Arkansas, Pennsylvania, and Kentucky, indicate that considerable economic benefits can be generated from wildlife-related ecotourism and hunting and report that elk quickly became a key tourist attraction. Elk viewing is a popular activity and is compatible with other recreational activities in southeast Missouri. Elk viewing areas and/or educational centers have been established in other states and thousands of visitors generate considerable revenue for local economies.

Elk hunting is popular in eastern states with successful restoration programs. In 2009, more than 6,000 individuals applied for an elk permit in Arkansas and over 46,000 applied for an elk tag in Kentucky. In both states, special festivals and sporting events coincide with the annual permit drawings and the fall hunting season. Elk hunting contributes to local economies through the purchase of food, lodging, transportation, guide services, supplies, and land leasing. A 2007 Kentucky study found the average spent by those who either scouted and/or hunted for elk was $1,148.

PARTNERSHIPS: Woodland and glade management (i.e. timber harvest, woodland thinning, and landscape-scale prescribed burning) during the last 15 years and green-browse management have significantly improved this landscape for elk. The Department continues to manage and improve woodland, glade, and forest habitats and existing green-browse plots on Department land for wildlife. In addition, the plan proposes to develop cooperative open land habitat management plans with other state, federal, non-governmental organizations, and those landowners interested in managing land for elk.

The estimated cost for trapping, holding, relocating, testing and monitoring up to 150 elk in early 2011 is approximately $411,185. This estimate includes costs related to building holding pens, trapping, transportation, telemetry equipment, feed, research/monitoring and veterinarian supplies. Total project cost to the Department will vary depending on the number of animals

released, the methods of capture, volunteer commitment, and possible contributions from other organizations.

The Department will seek outside funding to help share the cost of a restoration program. The Rocky Mountain Elk Foundation has provided financial support for restoration programs in other states and has committed to contributing financial resources and volunteer time to elk restoration in Missouri.

The elk restoration plan includes:

- Establishing a well-defined elk restoration zone, encompassing 346 square miles (221,509 acres) in portions of Carter, Shannon, and Reynolds counties bounded by roads, property boundaries, and other identifiable landscape features (Figure 1).

- Managing public lands within the elk restoration zone for woodland, glade and green/browse food plots consistent with natural community management as an overarching goal.

- Developing cost share incentives for landowners in the area interested in improving habitat for elk on their property.

- Working with states (i.e. Kentucky, Arkansas) to trap and relocate up to 150 elk and utilize a "soft release" technique on Department land early in 2011.

- Monitoring the elk population post release to determine survival rates and movement patterns with a research project over the next several years.

- Implementing plans to address elk that leave the restoration zone onto private land where they are not welcome.

- Developing hunting regulations that sustain a viable Missouri elk population within the elk zone and maximize opportunities for hunting consistent with herd population goals, drawing on the experiences of other state fish and wildlife agencies.

- Implementing health testing protocols (Appendix A).

- Continuing the process of incorporating public input into the development of operational and management plans.

Missouri Elk Restoration Plan

Introduction

Elk were found throughout Missouri prior to European settlement (McKinley 1960). Historical accounts indicate elk were likely extirpated from the state by 1865. Elk is a native species to Missouri and restoring native species holds many benefits. Prompted by citizen requests, the Department conducted an elk reintroduction feasibility study in 2000. Results of the study indicated that elk restoration in Missouri was biologically feasible in portions of the Ozarks and, statewide, the public supported the restoration of elk. Due to disease and habitat concerns, the Commission suspended the Department's consideration of elk restoration in 2001, and directed staff to facilitate additional discussions to determine if concerns regarding elk restoration could be addressed.

Several factors have stimulated renewed interest in a Missouri elk restoration. Successful elk restorations have occurred in states such as Arkansas, Kentucky, Tennessee, and Pennsylvania with considerable natural resource management, recreational, and economic benefits. These restorations have resulted in the development of proven disease testing protocols with no known case of diseases being introduced to livestock or wildlife. In addition, a live-animal test for chronic wasting disease (CWD) in elk has been developed.

Since the mid-1990's, significant habitat improvements, such as glade and woodland restoration and green-browse management, have occurred on conservation areas and other properties in the proposed Peck Ranch Restoration Zone. These habitat improvements have created ideal habitats and food preferred by wildlife, including elk.

A recent letter from the Rocky Mountain Elk Foundation, continued citizen interest in elk restoration and questions from Conservation Commissioners stimulated a presentation at the July 2010 Conservation Commission meeting. The presentation summarized the 2000 elk study and provided an update on the issues of habitat availability and the current status of CWD. Following the presentation, the Conservation Commission directed Department staff to reinstate plan development. This elk restoration plan is based on current information and knowledge, incorporating the following:

1. A well-defined **elk restoration zone** in portions of Carter, Shannon, and Reynolds counties with characteristics of large public land ownership, limited agricultural land and few roads;
2. **Habitat management guidelines** for improving elk habitat on private and public land;
3. **Herd management guidelines** including release protocols, population objectives, monitoring protocols, actions to address elk that leave the restoration zone onto private land where they are not welcome, and hunting as the primary management tool;
4. **Health protocols**, including animal health testing and a contingency plan, to ensure wildlife and livestock remain healthy; and
5. **Public input** by seeking comments through public meetings near the potential elk restoration zone and ongoing statewide requests for public comments, and providing information to citizens and organizations.

The Commission endorsed the consideration of elk restoration based on the following:

- Members of the public have expressed interest and support for restoring elk.
- Elk are native to Missouri, having been extirpated from the state by the mid 1800's.
- An important charge of the Conservation Commission is the restoration of native wildlife resources of the state.
- Restoration of elk in response to this charge would have recreational and economic benefits.

Elk Restoration Zone

The elk restoration plan includes establishment of a well-defined elk restoration zone, encompassing 346 square miles (221,509 acres) in portions of Carter, Shannon, and Reynolds counties bounded by roads, property boundaries, and other identifiable landscape features (Figure 1).

Background:

Elk are highly adaptable as indicated by the pre-settlement diversity of habitats occupied by elk in Missouri (Bennitt and Nagel 1937). The 2000 feasibility study (Missouri Department of Conservation 2000) used habitat suitability and potential for human-elk conflicts to define suitable elk range in Missouri. Because of agricultural activity, all of northern and most of western and southeastern Missouri were excluded from consideration. A defined geography around Peck Ranch Conservation Area was identified in the 2000 elk feasibility study as a potential restoration site. This landscape was chosen because of suitable habitat conditions, high public land ownership, low public road density, and low density of row crops and livestock, which are characteristics of elk ranges found in other states with successful elk restoration programs (Table 1).

Table 1. Restorations in Eastern and Midwestern States.

State	Time of Restoration	Number Reintroduced	Size of Range (mi^2)	Hunted?	2008 Harvest	Current Population
Arkansas	1981-1985	112	600	Yes	16	500
Kansas	1981-1994	87	Unknown	Yes	15	175
Kentucky	1997-2002	1,553	6,875	Yes	346	11,000
Michigan	1918	7	600	Yes	308	900-1,200
Minnesota	early 1900's	27	45	Yes	8	55
Oklahoma	1969-1972 and 2004	411	130	Yes	188	2,300
North Carolina	2001-2002	52	1,047	No	0	95
Pennsylvania	1913-1926	177	3,750	Yes	42	700-750
Tennessee	2000-2003	167	1,047	Yes	0	300
Wisconsin	1995	25	715	No	0	164

A similar area was chosen for the proposed elk restoration plan. The proposed elk restoration zone covers parts of Carter, Shannon, and Reynolds counties and is bounded by public roads, property boundaries, and other identifiable landscape features (Figure 1). The proposed restoration zone boundary consists of portions of State Highways 19 and 106 and State Routes H, D, and B. County roads, property boundaries, and the Jack's Fork River make up the other portions of the restoration zone boundary. This landscape was chosen because of:

- Suitable habitat conditions,
- High public land ownership and public access,
- Low public road density,
- Low density of row crops and livestock, and
- Landowner support.

The landscape characteristics of the proposed 346-square-mile proposed elk restoration zone in and around Peck Ranch and Current River conservation areas include:

- Forestland: 206,003 acres (93%)
- Cropland: 222 acres (0.1%)
- Openland: 11,075 acres (5%)
- Land held in public trust or non-governmental organization: 115,705acres (52%)
- L-A-D Foundation property (Pioneer Forest-private): 59,712 acres (27%)
- Land held in public trust or privately owned and open to the public: 175,417 acres (79%)
- The interior of the proposed elk restoration zone has only 33 miles of paved road.
- Low traffic volumes on paved highways in the proposed elk restoration zone.

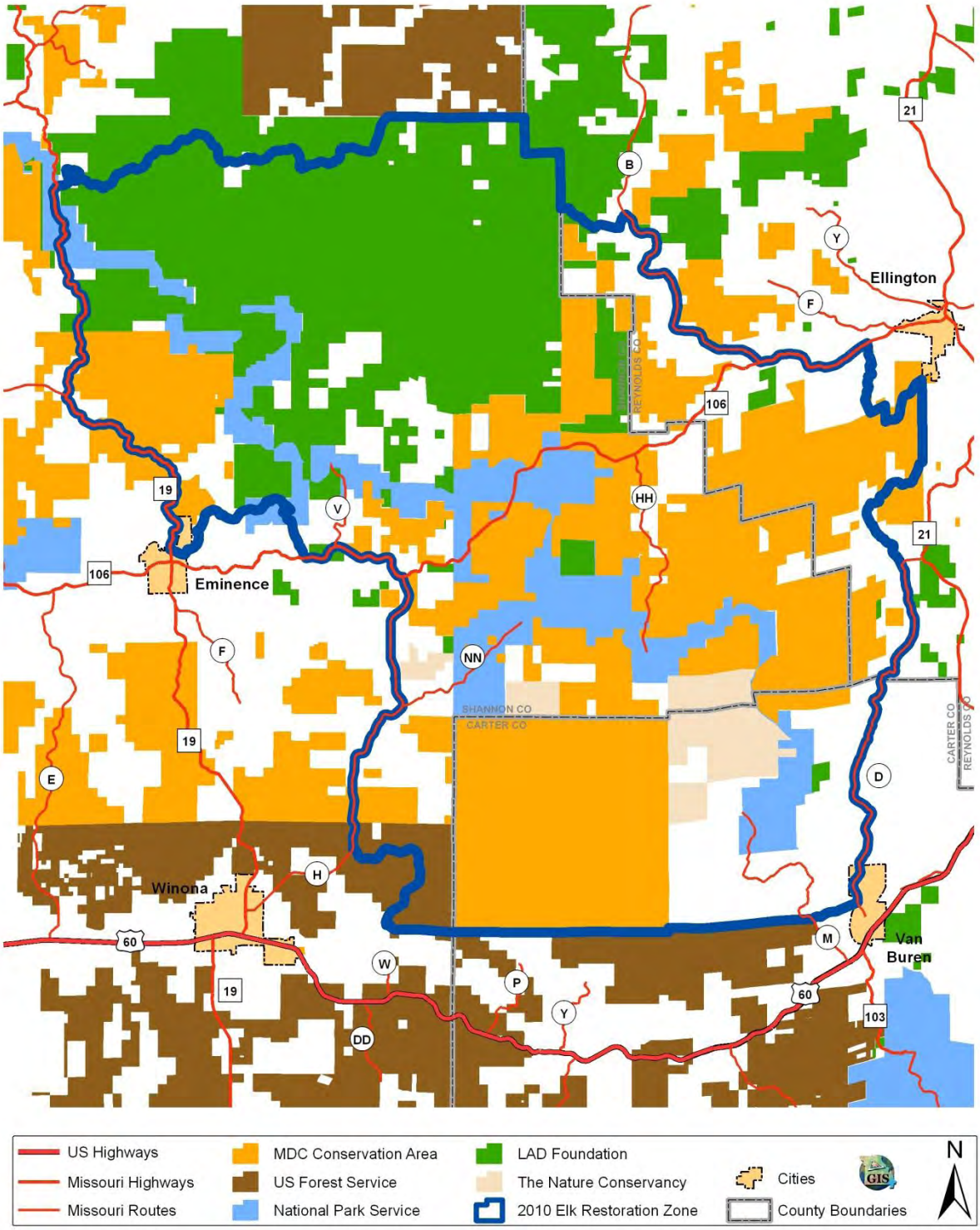
Much of the forestland in the proposed elk restoration zone is woodland that provides excellent summer and winter habitat for foraging and calving. The open nature of the woodlands allows light to penetrate and develop plant growth and the surrounding more densely timbered areas provide shade, escape cover, and area for hiding young elk calves (Figure 2). Virtually no row crops and limited cattle production occur within the proposed restoration zone.

Figure 2.Typical woodland habitat for wildlife on Department land.

The 346-square-mile elk restoration zone consists of land held in public trust by the Missouri Department of Conservation, National Park Service, and United States Forest Service (representing 49% of area). The Nature Conservancy (3% of the area) and Pioneer Forest, owned by the L-A-D Foundation (27% of the area), own and manage land in the proposed restoration zone and have provided written support for elk restoration. It is important to note that both allow public access. As a result, 79% of the land in the proposed restoration zone provides public hunting access. This is significantly higher than other eastern states with elk ranges. For example, Arkansas has a 500-square-mile elk range with only 27% of the range in public ownership. In addition, other private landowners in the elk restoration zone have voiced support for elk restoration.

The proposed 346-square-mile elk restoration zone contains 33 miles of paved highway and fewer roads per square mile than elk ranges in other eastern states. For example, Arkansas' elk area has about 2.1 miles of roads per square mile compared to 1.2 miles of roads per square mile in Missouri's proposed restoration zone. Traffic surveys from the Missouri Department of Transportation indicate that vehicle volume on paved roads in the proposed restoration zone is low, when compared to other Missouri highways. In 2008, the average annual daily traffic volume on Highway 106 east of Eminence was 245 vehicles and Highway 106, just west of Ellington averaged 386 vehicles per day. Highway 19 north of Eminence averaged 464 vehicles per day. Highway D, northwest of Van Buren, averaged a daily traffic volume of only 326 vehicles per day.

Figure 1: Proposed Elk Restoration Zone.



Habitat Management Guidelines

The elk restoration plan includes managing public lands within the elk restoration zone for woodland, glade and green/browse food plots consistent with natural community management as an overarching goal.

The elk restoration plan includes developing cost share incentives for landowners in the area interested in improving habitat for elk on their property.

Background:

Elk use a variety of habitats, but a mix of forest and openings (dominated by grass and other herbaceous plants) is ideal. A common element of elk restorations that have occurred in other states is that elk seek out and use open areas (Larkin et al. 2004, Anderson et al. 2005). Generally, maintenance of cool-season legumes and grasses on these open areas are most attractive to elk, especially in winter.

Forest management also can affect suitability for elk. Since the mid-1990's, habitat management on public lands has created woodland habitat that is conducive to numerous wildlife species, including elk.

Woodland management involves tree thinning and periodic landscape-scale prescribed burning (500 to 5,500 acre burn units) to create an open canopy (30-100%) with dense ground flora dominated by forbs, grasses and sedges; a landscape producing desirable forage and cover for elk. Management for savanna and glade habitats has occurred on public lands, producing forbs and grasses also desired by elk (Telesco et al. 2007).

Although elk habitat overall has improved in the proposed elk restoration zone since 2000, restoration and maintenance of open land will continue to be emphasized (DeBerti 2006). Woodland restoration opportunities also exist on other public and private land in the restoration zone. A landscape that includes at least 10% in woodland, glades and openings (grassland and annual plantings) should be a management goal. The Department will be a key player in promoting this management approach. In follow-up meetings with the National Park Service, Forest Service, L-A-D Foundation and The Nature Conservancy, all have expressed interest in improving habitat for elk.

The Department will continue to manage and improve green-browse plots on conservation areas to benefit all wildlife species. Other forest management practices, such as timber harvest and timber stand improvement, will continue as these practices enhance wildlife habitat and sustain forest health. The National Park Service has expressed an interest in improving bottomland fields (i.e., overseedings, renovating old fields, etc.) in the National Scenic Riverways to restore a cultural heritage feature that also provides desirable forage for wildlife, including elk.

During the open house public forums, several landowners were interested in cost-share incentives to create elk-friendly conditions on their land located within the proposed restoration zone. The Missouri Department of Conservation offers a wide range of landowner assistance programs. These voluntary programs help private landowners meet natural resource objectives for their property. Some programs are cooperative efforts with the federal government and conservation organizations, while others are unique to the Department. The Department's

Landowner Assistance Program is a popular cost share program that offers a variety of conservation incentives to help landowners improve their property for wildlife.

The restoration plan proposes establishing special habitat incentives for landowners in the area wanting to improve elk habitat on their land. Examples could include cost share for establishing a wildlife-friendly mix of cool-season grass and legumes (i.e. timothy, orchard grass and clover). Cost share could be provided for converting existing cover, seeding, lime, and fertilization. Improving existing pastures will promote grassland health, productivity, and vegetative composition. Cost share could also be provided for inter-seeding legumes, natural community restoration, prescribed burning, and alternative watering sources.

The Department could offer landowners in the proposed restoration zone wildlife-friendly legume seed (i.e. red clover or annual lespedeza) to inter-seed into existing pasture. Interseeding grass pasture will improve grassland health and provide more palatable forage for cattle, elk and other wildlife. Seed could be distributed to landowners at special events to allow one-on-one contact with Department staff and to discuss habitat management options.

The Department is working with other state fish and wildlife agencies to identify fencing standards and techniques (i.e. high visibility marking, electric fence, reinforcement with stabilizers) that will minimize potential fencing concerns. Staff could develop best management practices for landowners who are interested in improving wildlife habitat which is compatible with livestock operations (Hanophy 2009).

Herd Management Guidelines

SOURCE OF ELK, TRAPPING AND RELEASE:

The elk restoration plan includes working with states (i.e. Kentucky, Arkansas) to trap and relocate up to 150 elk and utilize a "soft release" technique on Department land early in 2011.

Background:

The number of elk proposed to be reintroduced the first year will depend on availability, but a limited release of up to 150 elk is preferred. Additional releases in following years will be considered depending on the status and distribution of the initial elk herd. Elk will be held for at least 93 days in the state of origin for testing prior to relocation to Missouri (see Health Testing Protocol section of plan for details). After testing is complete, elk will be transported by trailers to a holding pen on Department land in the elk restoration zone. Yearlings and adults will be transported separately from calves to reduce risk of injury.

Most restoration programs have used corral traps (Schemnitz 1994) to capture elk or a net gun fired from a helicopter, which may be more efficient and cost effective (Jessup et al. 1988). The Department will use the most efficient and cost-effective method for capturing elk and consider the donor state's experiences with various capture methods.

Antlers on bulls will be removed (if not already dropped) to reduce risk of injury to trappers or other captured elk. The age and sex composition of the elk will depend on the source herd but, based on other restorations, the likely composition will be around 1 male to 3 females. Because few adult bulls will be available, males will be mostly calves (about 3 calves to 1 yearling-adult); the female age composition will be mostly adults (1 calf to 3 yearling-adults).

Historically, most elk restorations have been done by hard releases in which the elk were typically transported in trailers and immediately turned loose on a release site (Larkin et al. 2003). Ontario experimented with soft-release techniques in which the elk were confined in a pen on the release site for various periods of time before being released. They found that dispersal distances were shorter and survival higher for elk confined for longer periods (Ryckman et al. 2009). Based on Ontario's experience with soft releases, the Department proposes holding the elk for 5-6 weeks in Missouri prior to being released. One pen design Ontario used was circular, 12-foot high, and around 200 feet in diameter (0.7 acres) with a high opaque or translucent woven covering as a visual barrier. Ontario held 50-70 elk in the pen for up to 16 weeks prior to release. A one-acre holding facility is sufficient for up to 75 elk. The holding pen will be located on a generally level, open site with interspersed trees. It will be out of sight of public roads to minimize disturbance. The elk will be fed and provided fresh water.

MONITORING:
The elk restoration plan includes monitoring the elk population post release to determine survival rates and movement patterns with a research project over the next several years.

Background:
The Department will closely monitor survival, reproductive rates, habitat use, and movement. All elk released will be fitted with VHF or GPS transmitters with mortality sensors that will allow quick detection and resolution of mortalities. Elk locations will be monitored regularly to determine movement and habitat use. A sample of calves will be located and marked with radio transmitters to determine movement and survival rates. Fall calf to cow ratios will be measured through observations of radio collared cows to assess recruitment (elk normally have only one calf per year). Measurements of the demographics of the herd (survival and reproductive rates) will be used to develop a population model which will track the success of the restoration and guide future population management. Determining elk movement patterns and habitat use will help guide habitat management and predict how elk will use the landscape. A detailed research project proposal will be developed in cooperation with Dr. Joshua Millspaugh at the University of Missouri.

POPULATION MANAGEMENT AND HUNTING:
The elk restoration plan includes implementing plans to address elk that leave the restoration zone onto private land where they are not welcome.

The elk restoration plan includes developing hunting regulations that sustain a viable Missouri elk population within the elk zone and maximize opportunities for hunting consistent with herd population goals, drawing on the experiences of other state fish and wildlife agencies.

Background:
A high percentage of public land ownership and lack of agriculture were some of the criteria in the definition of suitable elk range in Missouri. Experience from eastern states has shown that eastern elk behave differently than western elk because of favorable habitat and a mild climate. As a result, eastern elk tend to have smaller home ranges and exhibit less movement than western elk. With good habitat, which our restoration zone offers in southeast Missouri, an elk's home range

can be as small as 1-20 square miles, compared to 100 square miles in the western United States (personal communication, Tom Toman with the Rocky Mountain Elk Foundation).

The Department has developed, and the plan proposes to strictly enforce, procedures to address elk that wander outside the restoration zone onto private land where they are not welcome. As proposed, the Department will contact the landowner in follow up to concerns within 24 hours of being notified by the landowner. Department office phone numbers and conservation agent phone numbers are already provided as a public service to citizens. Department staff will use various methods, including trapping and relocating or euthanizing elk, to remove them from where they are not welcome.

Hunting is proposed to be implemented as soon as possible after the elk become established. As part of the post-release monitoring, the Department will develop a population model that will allow prediction of population growth, determination of when a hunting season is appropriate, and establishment of harvest quotas that will produce population levels compatible with available habitat and public interests.

Experience from other eastern and Midwestern states has shown that managed hunts are effective at maintaining an appropriate population density. In Kentucky, hunters must draw for an elk permit inside the state's elk area where most elk occur. However, hunters may purchase an elk hunting permit to hunt elk outside the state's elk hunting zone where a few elk occur. This combination of liberal hunting outside the elk zone and controlled hunting in the zone has proven effective in managing Kentucky's elk herd and serves as an example to consider when elk hunting regulations are developed in Missouri.

Health Testing Protocol

The elk restoration plan includes implementing health testing protocols (Appendix A).

Background:

The Missouri Departments of Agriculture (MDA) and Conservation have cooperatively developed a rigorous animal health testing protocol for free-ranging elk brought to Missouri (Appendix A). The health testing protocol developed for Missouri's restoration proposal exceeds those conducted during previous elk restoration efforts in other states and is based on the model health protocol developed by the Southeastern Cooperative Wildlife Disease Study (Nettles and Corn 1998, Corn and Nettles 2001) for the importation of free-ranging elk.

Elk relocated into Missouri for the purposes of the proposed elk restoration must originate from a CWD-free state. Potential donor states have a long history of testing elk and deer herds for a variety of diseases including CWD. Elk must test negative for CWD, brucellosis, and bovine tuberculosis prior to shipment to Missouri. Elk will also be tested for anaplasmosis, bovine viral diarrhea, blue tongue, epizootic hemorrhagic disease, Johne's disease, and vesicular stomatitis.

In an effort to continually monitor the condition and health of the restored elk population, all mortalities of relocated elk will be recovered as soon as possible, examined for cause of death, and tested for CWD. Additionally, any un-collared elk mortalities that are reported by the public or Department personnel will be investigated.

An animal health contingency plan has already been developed. In 2002, the Missouri Departments of Conservation, Agriculture, and Health and Senior Services formed a Cervid Health Committee to manage the risk associated with CWD. In 2003, the group developed a multi-agency contingency plan in the event that CWD was found in Missouri. This contingency plan has been effective by facilitating a swift response to the discovery of a CWD-positive deer in a captive facility in north Missouri early in 2010.

Other states with successful elk restoration projects have followed similar health protocols that have resulted in no cases of disease transmission to livestock or wildlife. A key point is that the proposed health testing protocol is more stringent/ restrictive than animal movement protocols currently required to move livestock or captive elk into Missouri.

Public Input

The elk restoration plan includes a continuous process of incorporating public input into the development of operational and management plans.

Background:

The Department continues a long history of obtaining public input into management efforts using a variety of public involvement techniques. During the 2010 elk restoration public input process, the Department met with a variety of stakeholders (e.g. Conservation Federation of Missouri, Missouri Cattleman's Association, Missouri Forest Products Association, Soil and Water Conservation Districts, Rocky Mountain Elk Foundation, Missouri Farm Bureau, Ozark Private Property Rights Congress, elected officials, etc.), engaged in one-on-one meetings with landowners in the proposed elk restoration area, responded to written correspondence and electronic media requests from members of the public (e.g. email, Facebook, and web comments), and held three public open house forums. Two articles on elk restoration were printed in the August and September issues of the *Missouri Conservationist* as well as several news releases that prompted citizens to contact the Department with input on elk restoration. All comments were recorded into one database for analysis.

The open house public forum is an alternative to a formal public meeting and utilizes a series of stations where subject matter experts are available to answer questions and receive comments from attendees. Elk restoration open house public forums were conducted in each of the three counties within the proposed elk restoration zone to ensure residents of those counties had an opportunity to learn more about elk restoration in Missouri and provide comments. The three public forums were held between 5:00-8:00 PM on the following dates: August 23, Carter County – Van Buren High School; August 24, Shannon County – Eminence High School; and August 26, Reynolds County – Ellington High School.

Eight stations were set up at each open house with information on a variety of elk restoration topics. Department staff attended 6 of the 8 stations and were available to answer questions from the public; station 5 on animal health was also attended by Missouri Department of Agriculture (MDA) staff. The eight stations were:

1. **Welcome:** Everyone was greeted and provided an information packet that included an "Elk Restoration in Missouri" fact sheet, a layout of the meeting with names of the

stations, a comment card printed on cardstock that was color coded for each location, and a pen.

2. **Elk Restoration in Missouri:** Highlighted a continuous loop video on elk restoration featuring MDC Resource Scientist, Dr. Lonnie Hansen, obtained from the Department website and also available on YouTube.
3. **Proposed Elk Restoration Zone:** A map was displayed depicting the elk restoration zone proposed during the elk restoration report provided to the Commission in 2000.
4. **Elk and Wildlife Management:** Provided information on potential property damage concerns and potential for vehicle collisions.
5. **Elk and Animal Health:** Missouri Department of Agriculture staff including Dr. Taylor Woods, State Veterinarian; Dr. Linda Hickam, Assistant State Veterinarian; and Dr. Joe Baker, District Veterinarian. Staff from MDA fielded many questions from the public regarding disease testing and animal health protocols, which addressed concerns voiced by participants over livestock and wildlife health. MDC staff was also available for questions at this station.
6. **Elk and Recreational Uses:** Provided information on potential conflicts between other recreational uses and management of Department lands that provide excellent wildlife habitat.
7. **Economics of Elk Restoration:** Utilized the new Department video "Conservation Pays" highlighting the economic importance of conservation. Information on economic benefits of elk restoration from other states was available to the public.
8. **Share Your Comments:** Featured a comment box for attendees to deposit comments and laptop computers for the public to enter their own comments. Department staff were also present to enter public comments into the computer for attendees. Staff emphasized that comments could be submitted via the web at any time. For the public's convenience, each station had a box available for submitting comment cards.

A total of 309 people attended three public forums in Van Buren, Ellington, and Eminence, with attendance almost equally distributed among the three locations. The open house process provided each person a chance to personally interact with experts on each element of the proposed elk restoration, to get answers to specific questions they might have, and voice support or concerns in an informal setting in the absence of open public conflict.

The collective sentiment of staff was that comments and discussions at the open house public forums were generally positive, although concern and opposition were expressed by some in attendance. A total of 137 comment cards were received at the meetings with responses in favor of elk restoration by a 5:1 margin. Concerns expressed were similar among the three open house public forums and included forage depredation, damage to fences, and elk-vehicle collisions. Supporters mentioned hunting and viewing opportunities, economic benefits, and restoration of a native species as positive elements of an elk restoration.

During the open house public meeting forums, staff, and local citizens were actively engaged in conversations about elk as well as other conservation opportunities (e.g. private land assistance).

Media outlets were represented at the forums. KTVS TV of Cape Girardeau featuring a segment on a morning news story. Several newspapers featured stories on the project including: Rural Missouri (monthly magazine of Missouri's electrical cooperatives), Reynolds County Courier,

Ellington; Shannon County Current Wave, Eminence; Daily American Republic, Poplar Bluff; Summersville Beacon; River Hills Traveler (monthly magazine); and the Mountain View Standard. Radio coverage included National Public Radio and the local station in West Plains.

In addition to the three public open house meeting forums, public input was also obtained via internet, email, comment cards from the Missouri State Fair, letters or phone calls, and personal contacts by employees of the Department. A total of 2,704 comments were received during the period July 15 – September 30, with comments in favor of elk restoration by a 4:1margin. In a comprehensive statewide survey done in 2000, results also indicated the majority of the citizens were in favor of elk restoration.

The comments for which residency could be determined within the proposed elk restoration zone (Carter, Shannon, and Reynolds counties) were 3:1 in favor of elk restoration. Those in favor of elk restoration mentioned hunting and viewing opportunities, economic benefits, and restoration of a native species as positive elements of an elk restoration. Those opposed to elk restoration most often cited private property damage, elk-vehicle collisions, disease concerns, and restoration costs.

The comment period offered an opportunity to interact with the public and allowed interested citizens input for those inclined to state an opinion on elk restoration in Missouri. Concerns were similar to those expressed in 2000. Public input received during the last three months suggests support for elk restoration in Missouri, but urged the Department to address concerns expressed by citizens. Successful management of Missouri's natural resources involves a partnership with interested citizens and acknowledgement that input will be used to guide conservation management decisions. During the public comment period the Department listened to those directly affected as well as those not in the affected area. This input is critical for shaping Department objectives for elk restoration.

Recreational and Economic Benefits and Partnerships:

RECREATIONAL AND ECONOMIC BENEFITS: Experience from other states such as Arkansas, Pennsylvania, and Kentucky indicate that considerable economic benefits can be generated from wildlife-related tourism and hunting (Lord et al. 2000, Fermata Inc. 2002, Rocky Mountain Elk Foundation and Southern and Eastern Kentucky Tourism Development Association 2007). Elk hunting is an important recreational activity. According to the National Hunting and Fishing survey and generates about one billion dollars ($1B) annually to the U.S. economy (Wagner, 2008). Eastern states that have restored elk, such as Pennsylvania, Kentucky, and Arkansas, report elk quickly became a key tourist attraction. Elk viewing areas have been established in other states and thousands of visitors generate considerable revenue for local economies.

Elk hunting is popular in eastern states with successful restoration programs. In 2009, more than 6,000 individuals applied for an elk permit in Arkansas and over 46,000 applied for an elk tag in Kentucky. In both states, special festivals and sporting events coincide with the annual permit drawings and the fall hunting season. Elk hunting contributes to local economies through the purchase of food, lodging, transportation, guide services, supplies, and land leasing. A 2007 Kentucky study found the average spent by those who either scouted and/or hunted for elk was $1,148.

PARTNERSHIPS: The Department will seek outside funding to help pay for a restoration program. The Rocky Mountain Elk Foundation has provided financial support for restoration programs in other states and has committed to contributing to elk restoration in Missouri. Rocky Mountain Elk Foundation members have also expressed an interest in volunteering to assist with elk restoration.

RESTORATION COSTS: The estimated cost for trapping, holding, relocating, testing, and monitoring up to 150 elk in early 2011 is approximately $411,185 (Table 2). Exact costs depend on the number of animals released and the methods of capture. The Rocky Mountain Elk Foundation has also indicated a willingness to volunteer with many aspects of the elk restoration program and have been a tremendous partner particularly in Kentucky where they have supported elk restoration by donating over $1.4 million to the program.

Table 2. Draft Elk Restoration Budget for FY2011 based on release of 150 elk in Spring 2011.

Capture and hold 150 elk in donor state	
Capture costs - helicopter with net gun	$150,000
Holding pen for multiple state use	$40,000
Feed	$13,950
Disease test (testing in donor state & Mo)	$11,250
Care of elk	$3,120
Transport and hold 150 elk in Missouri	
Holding pens – 2***	$10,000
Portable hydraulic squeeze chute	$12,000
Water tanks - 2	$1,100
Transport elk	$1,500
Feed	$5,250
Total cost to import elk	**$248,170**
Monitor demographics and movement	
VHS transmitters - 125 @ $250	$31,250
GPS/Argos transmitters - 25 @ $3200	$80,000
Argos download fees - $25/month/elk - 3 months	$1,875
PhD student - 1 semester	$9,750
MS student - 1 semester	$8,500*
Hourly employee - 1 @ $12/hr - 3 months	$6,240
Hourly employees - 2 @ $10/hr - 3 months	$10,400
Miscellaneous equipment/supplies	$5,000
Total cost to monitor elk	**$153,015**
Elk population management	
Miscellaneous equipment/supplies	$10,000
Total for elk population management	**$10,000**
Total restoration costs - FY2011	**$411,185**

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Appendix A. Missouri Departments of Agriculture and Conservation animal health testing protocol for imported free-ranging elk.

Animal Health Testing Protocol
For
Proposed Elk Restoration

August 4, 2010

The Missouri Departments of Agriculture (MDA) and Conservation (MDC) have cooperatively developed the following animal health testing protocol for imported free-ranging elk in the event the Missouri Conservation Commission proceeds with plans to restore elk to a well-defined geography in parts of Carter, Shannon, and Reynolds Counties focused around the Peck Ranch Conservation Area. This health testing protocol will ensure the health of Missouri's valuable wildlife and livestock resources.

All elk imported into Missouri for the purposes of the proposed elk restoration must comply with the following requirements:

- Must be officially identified by a microchip and at least one other method of official identification (MDC will equip animals with radio transmitters).
- Must be tested for Chronic Wasting Disease (CWD) utilizing rectal mucosa-associated lymphoid tissue biopsy.
- Must be imported from a CWD-free state.
- Must have two single cervical bovine tuberculosis (TB) tests done by an accredited veterinarian at least 90 days apart, the last test must be within 90 days of importation to Missouri.
- Must be tested for brucellosis, blue tongue, anaplasmosis, epizootic hemorrhagic disease, vesicular stomatitis and Johne's disease within 90 days of importation into Missouri.
- Must be tested for Bovine Viral Diarrhea-persistently infected by utilizing ear notches and an immunohistochemistry analysis or approved test.
- Must be treated for internal and external parasites in the state of origin within 10 days prior importation into Missouri.

The source herd may be sampled and tested (e.g., hunter harvested animals) for tuberculosis to eliminate the need for post-movement single cervical tuberculosis testing. A statistical sample of tuberculosis testing from hunter harvested elk in the state of origin may be used to eliminate the need for post-movement single cervical tuberculosis testing.

Tuberculosis may also be included in the serological test panel pending licensure of new testing protocols. Chembio Diagnostics Systems, Inc. anticipates licensure of a serological tuberculosis test for elk and red deer within the next month.

Upon arrival into Missouri and prior to release, elk must comply with the following requirements:

- Must be isolated and remain in an enclosed area to evaluate health. The state veterinarian will, based on test results and health conditions, determine period of time needed prior to release.
- Must be tested for brucellosis, Johne's disease, anaplasmosis, vesicular stomatitis, epizootic hemorrhagic disease and blue tongue via serological analysis.
- Must be tuberculosis tested utilizing a single cervical test and performed 90 days after the last tuberculosis test if surveillance sampling/testing was not performed on harvested animals in the state of origin.
- Must be treated for external and internal parasites.
- All harvested elk will be tested for CWD and a reasonable attempt made to test all other elk mortalities. In addition, a necropsy and additional tests will be performed if warranted.

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